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Indian Standard

CODE OF PRACTICE FOR INSTALLATION, OPERATION AND PREVENTIVE MAINTENANCE OF GRAIN COMBINE

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CODE OF PRACTICE FOR INSTALLATION, OPERATION AND PREVENTIVE MAINTENANCE OF GRAIN COMBINE

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Indian Standard

CODE OF PRACTICE FOR INSTALLATION, OPERATION AND PREVENTIVE MAINTENANCE OF GRAIN COMBINE

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 27 July 1981, after the draft finalized by the Harvesting, Threshing and Transport Equipment Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 Combine (combine-harvester-thresher) is a complex machine and involves heavy initial investment. It is, therefore, imperative that it is utilized for reasonably long working hours for several years and the cost of operation is minimized. Though basic design of combine and the quality of the material used for its different components are important, proper installation, operation and preventive maintenance of the combine is equally important in achieving these objectives. This code provides guidelines for these. The terminology with regard to combine and its components is covered under **3** of IS : 8122 (Part I) - 1976*.

0.3 In the preparation of this standard, assistance has been received from Tractor Training Centre (Ministry of Agriculture), Hissar.

1. SCOPE

1.1 This code prescribes the guidelines for installation, operation and preventive maintenance of grain combine (combine-harvester-thresher).

2. INSTALLATION/SETTING OF GRAIN COMBINE FOR OPERATION

2.0 Before starting the combine, general inspection of the unit and of the prime mover should be carried out. Special attention should be paid for the points given under **2.1** to **2.15**.

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*Test code for combine harvester thresher: Part I Terminology.

2.1 If the header or any sub-assembly has been removed during transportation or storage, mount the unit on combine as per instructions mentioned in operator's manual of the machine.

2.2 All fasteners should be checked and tightened, if required.

2.3 All the lubrication points should be properly greased or oiled as per manufacturer's recommendation.

2.4 Ensure that all the sub-assemblies of machine are free from all foreign matter, such as chaff, straw, stone and dust.

2.5 Check for proper tensioning of drive belts and chains.

2.6 Check for free movement of all moving or rotating parts.

2.7 Check for the correct direction or rotation of the moving parts.

2.8 Check for recommended inflation pressure in tyres.

2.9 Check that all safety guards/shields are properly secured to the machine.

2.10 Check and replenish the following, if necessary:

a) Oil level in the engine crank-case,
b) Oil level in the gear box,
c) Oil level in the hydraulic system reservoir (if available),
d) Fuel level in the fuel tank,
e) Water level in the radiator, and
f) Oil in wet-type air cleaner.

2.11 Check all the systems of prime mover for proper working as specified in the operator's manual.

2.12 In case of tractor-operated combine, use the tractor of recommended power, and ensure that power take-off (PTO) speed conforms to the recommendations of the combine manufacturer. Make drive connection to machine as per the instruction contained in operator's manual of the combine.

2.13 A self-propelled combine should be equipped with fire extinguisher where as in case of tractor-operated combines, the tractor should be fitted with spark arrester.

2.14 The stone trap should be checked. Stones, if present, should be emptied and trap put to effective position again.

2.15 Depending on crop and field condition, necessary adjustments in all the systems (cutting, conveying, threshing, separating, cleaning and collecting, etc) of the combine shall be made in accordance with the operator's manual. Attachments, such as lodged crop lifter, crop dividers, if required, should be fitted.

3. OPERATION OF COMBINE

3.1 The combine shall be operated by a skilled and trained operator.

3.2 Ensure that check bunds and ridges of abnormal height, which may hinder the smooth working in the field, have been flattened.

3.3 If required, ensure that recommended width of swath from head lands and side lands have been cut for first run of the machine/tractor.

3.4 Prior to starting the engine and engaging the working mechanism, warn the personnel by blowing the horn.

3.5 Before starting the engine, check the following:

a) gear change lever is in neutral position;

b) main power drive (in case of PTO-operated machine) and drive lever (in case of self-propelled machine) are disengaged;

c) In the case of tractor-operated combines, never start the tractor without being seated well in the tractor seat; and

d) Before moving the tractor-operated combines, ensure that there are no obstructions to the wheels (like animals or persons sitting near the wheels).

3.6 After starting and warming-up of engine, keeping the gear change lever in neutral position, engage main power drive and other drive levers of different sub-assemblies of machine and check for smooth operation of all the systems under no-load condition.

3.7 In case of self-propelled combine, brake pedals should be coupled while driving on roads. However, during field operations while negotiating sharp bends these may be decoupled. In case of tractor-operated combines, the tractor brakes should be locked together.

3.8 Follow the pattern of operation as suggested in operator's instruction manual (*see also* Fig. 1 and 2 for PTO-operated and self-propelled combine respectively).

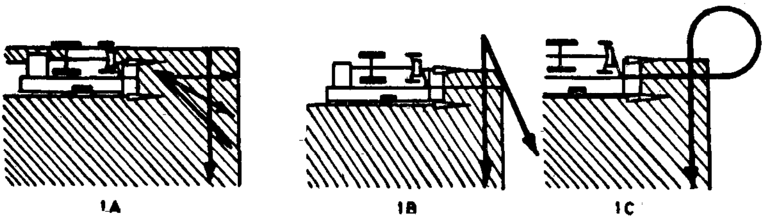
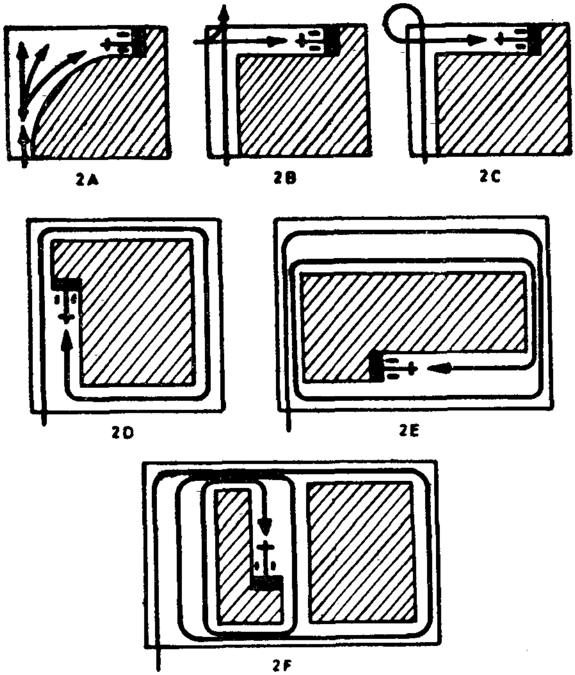


FIG. 1 PATTERN OF OPERATION FOR PTO-OPERATED COMBINES INDICATING WORKING PASSAGE AROUND FIELD CORNERS



2A, 2B, 2C — Working Passage Around Field Corners
2D — Harvesting Square Field After Covering the Corners
2E — Harvesting Rectangular Elongated Field After Covering the Corners
2F — Harvesting Large Sized Field (Dividing into Smaller Parts)

FIG. 2 PATTERN OF OPERATION FOR SELF-PROPELLED COMBINE

3.9 In first few runs, depending upon the field and crop conditions, make selection or correction for travel speed; and speed of reel, threshing cylinder, rack/straw walker, blower; cylinder-concave clearance; air quantity; sieve opening; etc.

NOTE — Once position of throttle lever is set in order to get desired speeds of various systems of combine, it should not be disturbed during operation. Any change in forward speed during operation should be done by change of gear shift lever or variator.

3.10 The adjustments which cannot be done from operator's seat, if possible, should be carried after disengaging the main drive and other drive levers (preferably after stopping the prime mover).

3.11 The lever for the drive to unloading augers should be disengaged except while unloading.

3.12 The radiator shall be cleaned periodically to avoid its choking by straw.

3.13 In case a combine is to be used as stationary thresher, disconnect the drive to the cutter bar and reel. Remove the reel, if possible. No person, other than employed for the operation of machine, be allowed near the machine. Persons working on the machine should be briefed about the safety aspect. Straw should be removed simultaneously.

3.14 Persons working on the combines should be strictly instructed not to smoke and/or consume any other intoxicant.

3.15 Do not touch moving parts of the machine.

3.16 In case of a failure during work, stop the machine, disengage the mechanism involved and only then proceed with the repair.

3.17 Hands should not be taken off the steering wheel during the ride; do not allow any unauthorized personnel to stay on the platform, nor in the direct vicinity of the machine.

3.18 Never overload the bagging platform of the combine. Remove the bags soon after filling.

4. PREVENTIVE MAINTENANCE

4.1 Make sure that lubrication and servicing schedules as given in operator's manual are followed.

4.2 Always use correct tool and correct methodology for any adjustment and minor repair.

4.3 Clean the machine thoroughly after each day's work according to the procedure mentioned in the operator's manual.

4.4 The combine shall be checked for proper working of different systems including clutches, brakes, steering system and hydraulic systems every day and readjusted, if required.

4.5 Take care while refilling the fuel tank, not to spill fuel by overfilling.

4.6 For any welding job required to be done on the machine, chaff and any other inflammable material should be removed. Battery terminals and alternator should be disconnected before welding. While welding close to the bearing in the machine, earthing should be done properly.

4.7 Do not allow for any job to be performed underneath the header. Proper jacking of the header is essential to prevent any accident.

4.8 Insulation of electric cables shall not show any damage nor be aged beyond safety. Cables running near the movable parts of the combine shall be fastened and protected against rubbing and other damages.

4.9 Entrust specialized repairs only to authorized personnel.

4.10 Always use genuine spares sold through manufacturer's representatives.

4.11 Tractors discharging excess of carbon through silencer may cause fire hazards during harvesting. Get the tractor serviced before using it for combine operation.

4.12 The periodical maintenance of engine should be done in accordance with the instructions of the manufacturer.

5. DIAGNOSIS OF COMMON FAULTS AND THEIR REMEDIES

5.1 Some of the common faults, their causes and remedies are given in Appendix A for guidance.

6. OFF-SEASON STORAGE

6.1 Clean the inner and outer side of the machine thoroughly.

6.2 Remove the sieves and clean them properly and apply a coat of used engine oil or suitable rust preventive. The same should be done for chains of tailing and grain elevators, and for those of feeding conveyor.

6.3 On parts which may get rusted or wherever paint has come of because of moving parts, a coat of rust preventive or paint or used engine oil should be provided.

6.4 Clean up the concave, the shaker shoe floor, the stone separator, as well as the grain and tailing augers.

6.5 Take belts and chains off, clean them and store.

6.6 Slacken the over-load clutches and lubricate their working surfaces.

6.7 Repair or replace worn out and damaged parts.

6.8 Lubricate the fingers of the platform auger bar with oil. Other lubricating points should be properly greased or oiled.

6.9 Store the machine under a shed to protect from dust, rain and sun.

6.10 Jack up the combine to take the weight off the wheel tyres.

6.11 Servicing of the engine (in case of self-propelled machine) for storage should be done in accordance with the operator's manual of the engine.

6.12 Hydraulic cylinder shall not carry any load and the system should be topped up.

6.13 Apply a film of grease to the fuel tank surface on both the sides.

6.14 Charge the storage batteries (self-propelled machine) to capacity and re-charge them regularly.

6.15 Inspection windows should be checked and it should be ensured that they are properly closed.

6.16 The lever for drive to unloading augers should be disengaged except while unloading.

APPENDIX A

(*Clause* 5.1)

COMMON TROUBLE, REASONS AND THEIR REMEDIES

TROUBLE (1)	REASON (2)	REMEDY (3)
Crop left uncut or partially cut	i) Knife sections or ledger plates worn or damaged	Replace or repair knife sections or ledger plates
	ii) Clearances between the knife sections and the ledger plates not correct	Correct the clearances
	iii) Knife bars worn or blunt	Re-grind the knife sections, sharpen or replace them
	iv) Slanting angle of the knife bar not correct	Check and correct it
	v) Registration of knife is not correct	Make adjustment to correct the same
Clogging of cut crop on platform auger	i) Reel set too high	Lower it to correct position
	ii) Crop conveyor speed is too low	Correct the speed
	iii) Reel extended forward excessively	Take it back to correct position
Harvested crop winding around reel	i) Too high reel speed	Lower the speed
	ii) Reel tines set incorrectly	Correct the setting of reel tines
Crop plants bend in front of moving combine	i) Reel speed is too low, that is, reel index is not proper	Adjust the rotary speed of the reel
	ii) Reel position is not correct	Adjust the position of the reel

(*Continued*)

TROUBLE (1)	REASON (2)	REMEDY (3)
Harvested crop winding around platform auger	i) Crop excessively humid	Harvest the crop at proper moisture
	ii) Auger set too high or too low	Set it correctly
	iii) Incorrect reel setting in relation to platform auger	Set the reel properly
Grain left unthreshed	i) Unripe crop	Wait till the crop is in ripened condition
	ii) Concave setting not parallel in relation to threshing cylinder	Set the concave properly
	iii) Too large concave cylinder clearance	Reduce the clearance for proper threshing
	iv) Too low speed of threshing cylinder	Correct the speed of threshing cylinder to recommended number
	v) Crop supply non-uniform through feeding conveyor	Check and ensure proper adjustment of feeding conveyor
Straw wrapping around threshing cylinder	i) Too low threshing cylinder speed	Increase the speed to recommended revolutions
	ii) Too low shaker shaft speed	Increase to the recommended shaker shaft speed
	iii) Crop humid	Reduce the travel speed or increase the cutting height
	iv) Incorrect concave setting	Set the concave properly
	v) Worn out threshing cylinder beater	Change by new one
	vi) Irregular crop supply by header unit in too large batches	Set crop dividers and reel properly for regular supply of crop

(Continued)

TROUBLE (1)	REASON (2)	REMEDY (3)
Grain breakage	i) Concave setting not parallel	Set the concave properly
	ii) Concave clogged	Clear the concave slots
	iii) Excessive quantity of grain mixed with ears supplied to threshing cylinder by tailing elevator	Set the shaker to correct position
	iv) Too high threshing cylinder speed	Lower the cylinder speed
Grain losses underneath the straw walkers	i) Incorrect setting and functioning of threshing unit	Set the cylinder-concave properly to ensure proper parallelism and clearance
	ii) Incorrect setting and functioning of the cleaning unit	Set the cleaning unit properly
	iii) Front of machine is too high	Lower the machine in front
	iv) Threshing cylinder speed too high	Decrease the threshing cylinder speed
Grain losses through shaker sieves	i) Concave - cylinder clearance not adjusted properly resulting into grain breakage and blowing away of the grains	Set the correct clearance
	ii) Concave clogged	Clean the concave
	iii) Sieve clogged	Clean the sieve
	iv) Chaffer shield adjusted too below	Adjust the chaffer shield to proper position
	v) Chaffer extension wrongly adjusted	Adjust chaffer extension correctly
	vi) The air flow on the sieves is too strong	Reduce the air flow
	vii) The travel speed and capacity are on the higher side	Reduce the travel speed and swath coverage

(Continued)

TROUBLE (1)	REASON (2)	REMEDY (3)
Grain losses caused by cleaning unit	i) Too strong air flow	Reduce the air flow
	ii) Too high blower speed	Reduce the blower speed
	iii) Upper sieves open too narrowly or clogged	Clear the upper sieves and provide proper opening
	iv) Lower sieves open too narrowly or clogged	Clear the lower sieves and provide proper opening
	v) Humid crop	Wait for drying of crop before harvest
	vi) Too low rotating speed of shaker shoe shaft	Check for drive tension and correct it
	vii) Sieves overloaded with threshed material	Increase the height of cut
Sieve overloaded	i) Too weak air blast	Adjust the blower opening
	ii) Drive belt of threshing cylinder slipping	Avoid slippage of belt
	iii) Sieve clogged or too narrowly open	Clear the sieves and proper opening be provided
	iv) Blower belt slips	Avoid slippage of belt
	v) Shaker drive belt slips	Avoid slippage of shaker drive belt
	vi) Too low main drive speed (engine/PTO speed)	Correct the speed to required number
	vii) Threshing cylinder speed not correct	Correct it to desired number

(*Continued*)

TROUBLE (1)	REASON (2)	REMEDY (3)
Too high return circulation through tailing elevator	i) Lower sieve clogged or open too narrowly	Clear the sieve and provide proper gap
	ii) Upper sieve open too narrowly or clogged partially	Increase opening of sieve and clear it
	iii) Incorrectly set air adjustments	Adjust the air requirement
	iv) Crop is humid	Wait for drying of the crop before harvesting
Grain not cleaned properly	i) Too weak air blast	Correct the air speed and adjust it
	ii) Lower sieve opened too widely	Decrease the opening
	iii) Upper sieve opened too widely	Decrease the opening
	iv) The chaffer extension not set properly	Set it properly
	v) Too high speed of threshing cylinder	Reduce the speed to desired number
	vi) Too less concave-cylinder clearance	Increase the clearance to required number
	vii) Machine not sufficiently loaded	Cover full width for harvesting